

## Claims

What is claimed is:

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1. An add/drop device comprising:

first and second optically coupled polarising beamsplitters;

a wavelength filter disposed between the first and second polarisation beams  
splitters;

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first and second polarisation rotators disposed between the filter and the first  
polarising beamsplitter and the filter and the second polarising beamsplitter, respectively;

first and second input ports optically coupled to the first and second polarising  
beamsplitters, respectively, each of the first and second input ports for launching a beam  
of light having a predetermined polarisation;

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first and second output ports optically coupled to the first and second polarising  
beamsplitters, respectively; and

first and second polarisation switches optically coupled to the first input port and  
one of the first and second output ports, respectively, each of the first and second  
switches for selectably rotating the polarisation of a beam of light launched therethrough  
and configured to work in cooperation with the other.

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2. An add/drop device as defined in claim 1, wherein the first polarisation switch is  
operable in a first mode of operation that allows at least a portion of a beam of light  
launched from the first input port to be directed to one of the first and second output ports  
via the filter, and to a second state that allows the beam of light to be directed to the other  
of the first and second output ports bypassing the filter.

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3. An add/drop device as defined in claim 2, wherein the first and second polarisation  
switches are configured to be in one of a same and an opposite mode of operation and to  
switch between modes of operation synchronously such that a beam of light having a

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predetermined polarisation launched from the first port reaches the other of the first and second ports with a same polarisation.

4. An add/drop device as defined in claim 2, wherein each of the first and second polarising beamsplitters comprises an interface between two anisotropic crystal blocks with perpendicular optical axes for passing light having a first polarisation and for reflecting light having a second orthogonal polarisation.
5. An add/drop device as defined in claim 4, wherein each of the first and second polarisation rotators are quarter waveplates.
6. An add/drop device as defined in claim 5, wherein the first input and first output ports comprise express input and output ports, respectively, the second input and second output ports comprise add and drop ports, respectively, and the second polarisation switch is optically coupled to the express output port.
7. An add/drop device as defined in claim 6, wherein the express input port and express output port are optically coupled to the first polarising beamsplitter, and wherein the wavelength filter comprises a transmissive filter that passes only a single predetermined channel.
8. An add/drop device as defined in claim 7, wherein the wavelength filter is a multidielectric filter.
9. An add/drop device as defined in claim 8, comprising a third quarter waveplate and a reflective surface disposed between the first and second polarising beamsplitters in parallel with the wavelength filter for directing a beam of light reflected by the interface back to the interface with an orthogonal polarisation.
10. An add/drop device as defined in claim 8, comprising a third quarter waveplate and a reflective surface disposed about an end of one of the two anisotropic crystal blocks for

directing a beam of light transmitted by the interface back to the interface with an orthogonal polarisation.

11. An add/drop device as defined in claim 7, comprising third and forth polarisation  
5 switches optically coupled to the add and the drop ports, respectively.

12. An add/drop device as defined in claim 6, wherein the express input and output ports  
are optically coupled to the first and second polarising beamsplitters, respectively, and  
wherein the wavelength filter comprises a notch filter that reflects only a single  
10 predetermined channel.

13. An add/drop device as defined in claim 12, comprising third and forth polarisation  
switches optically coupled to the add and the drop ports, respectively.

14. An add/drop multiplexer comprising:  
a first and a second polarising beamsplitter;  
a wavelength filter disposed between the first and second polarisation beams  
splitters;  
a polarisation rotator disposed between each polarising beamsplitter and the filter;  
20 an input port for launching a multiplexed beam of light having a predetermined  
polarisation into the first polarising beamsplitter;  
a first polarisation switch disposed between the input port and the first polarising  
beamsplitter for selectably rotating the polarisation of the multiplexed beam of light, the  
first polarisation switch operable in a first mode of operation wherein the polarisation is  
25 switched such that the first polarising beamsplitter directs the multiplexed beam of light  
away from the filter to an output port optically coupled to one of the first and second  
polarising beamsplitters, and a second mode of operation wherein the polarisation is  
switched such that the first polarising beamsplitter directs the multiplexed beam of light  
towards the filter where a portion of the beam of light is directed to a drop port optically  
30 coupled to the other of the first and second polarising beamsplitters and a remaining  
portion is directed to the output port;

an add port for launching an add beam of light having a predetermined polarisation into the second polarising beamsplitter such that it is directed to the output port having a same polarisation as the remaining portion; and,

5 a second polarisation switch optically coupled to the output port for working in cooperation with the first polarisation switch to selectably rotate the polarisation of one of the multiplexed beam of light and a composite beam of light including the remaining portion and the add beam of light.

10 15. An add/drop device as defined in claim 14, comprising third and forth polarisation switches optically coupled to the add and drop ports, respectively, for working in cooperation with each other to selectably rotate the polarisation of an add beam of light and a dropped beam of light, respectively.

15 16. An add/drop device as defined in claim 15, wherein each of the first and second polarisation rotators are quarter waveplates.

20 17. An add/drop device as defined in claim 16, wherein the input port and output port are optically coupled to the first polarising beamsplitter, and wherein the wavelength filter comprises a transmissive filter that passes only a single predetermined channel wavelength band

18. An add/drop device as defined in claim 17, wherein the wavelength filter is a multidielctric filter.

25 19. An add/drop device as defined in claim 18, wherein the wavelength filter is removable for replacing with another wavelength filter having a different wavelength selectivity.

30 20. In a four-port add/drop optical system comprising an input port and an output port for transmitting and receiving a multiplexed beam of light, respectively, an add port and a drop port for transmitting an added and dropped beam of light, respectively, a first and a

second polarising beamsplitter, a wavelength filter disposed between the first and second polarisation beams splitters, a polarisation rotator disposed between each polarising beamsplitter and the wavelength filter, and a first and a second polarisation switch optically coupled to the input port and the output port, respectively, a method comprising

5 the steps of:

launching a first beam of light having a known polarisation from the input port to the first polarising beamsplitter;

operating the first polarisation switch in a first mode of operation such that the first polarising beamsplitter directs the first beam of light away from the wavelength filter  
10 to the output port;

operating the first polarisation switch in a second mode of operation such that the first polarising beamsplitter directs the first beam of light to the wavelength filter, where a first portion is directed to the drop port and a second portion is directed to the output port;

15 launching a second beam of light having a known polarisation from the add port to the second polarising beamsplitter;

operating the second polarisation switch in one of the first and second modes of operation synchronously with the first polarisation switch.

20 21. A method according to claim 20, further comprising the steps of:

synchronously operating third and fourth polarisation switches optically coupled to the add and drop ports in one of the first and second modes of operation such that the second beam of light is only transmitted to the output port when the first polarisation switch is operated in the second mode of operation.

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